

<110> Istituto Superiore di Sanità
National Institutes of Health

<130> WPP88367

<151> 2003-10-15

<160> 20

<210> 1

<211> 1413

<212> DNA

<213> Homo sapiens

<220>

<221> CDS

<222> (85) .. (1395)

<220>

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<221> misc_feature
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 $\langle 222 \rangle \quad (11\bar{8}0) \dots (1240)$

<223> nucleotide sequence encoding the immunogenic peptide

cctgcatccc atgactcgga gctg atg gcc ttc atg acg agg aag ttg tgg 111
Met Ala Phe Met Thr Arg Lys Leu Trp
1 5

gat cag aag ata gcg gcc cta gag gac ctg gtg cag acc ctc cgg cca 207
Asp Gln Lys Ile Ala Ala Leu Glu Asp Leu Val Gln Thr Leu Arg Pro
30 35 40

tgt gtg cag ctg cag cgg cag gtc agg gag atg gag cgg ttc ctc agt 303
 Cys Val Gln Leu Gln Arg Gln Val Arg Glu Met Glu Arg Phe Leu Ser
 60 65 70

gag agc aag aca gtc tca gag cat ggc gag agg gac tgg atg aca gcc 399
Glu Ser Lys Thr Val Ser Glu His Gly Glu Arg Asp Trp Met Thr Ala
90 95 100 105

ttt gac agg ctg ctg gcc agc ctg cag gat ctt agt gag ctg gtg gta 495
Phe Asp Arg Leu Leu Ala Ser Leu Gln Asp Leu Ser Glu Leu Val Val

125	130	135	
gag ggt gac acc caa gtg aca cca gtg ccc ggc ggg gca cgg ctg cgt Glu Gly Asp Thr Gln Val Thr Pro Val Pro Gly Gly Ala Arg Leu Arg 140 145 150			543
acc ctc gag ccc atc ccg ctg aag ctc tac cgg aat ggc atc atg atg Thr Leu Glu Pro Ile Pro Leu Lys Leu Tyr Arg Asn Gly Ile Met Met 155 160 165			591
ttc gac ggg ccc ttc cag ccc ttc tac gat ccc tcc aca cag cgc tgc Phe Asp Gly Pro Phe Gln Pro Phe Tyr Asp Pro Ser Thr Gln Arg Cys 170 175 180 185			639
ctc cga gac ata ttg gat ggc ttc ttt ccc tca gag ctc cag cga ctg Leu Arg Asp Ile Leu Asp Gly Phe Phe Pro Ser Glu Leu Gln Arg Leu 190 195 200			687
tac ccc aat ggg gtc ccc ttt aag gtg agt gac ttg cgc aat cag gtc Tyr Pro Asn Gly Val Pro Phe Lys Val Ser Asp Leu Arg Asn Gln Val 205 210 215			735
tac ctg gag gat gga ctg gac ccc ttc cca ggc gag ggc cgt gtg gtg Tyr Leu Glu Asp Gly Leu Asp Pro Phe Pro Gly Glu Gly Arg Val Val 220 225 230			783
ggc agg cag cgg atg cac aag gcc ttg gac agg gtg gag gag cac cca Gly Arg Gln Arg Met His Lys Ala Leu Asp Arg Val Glu Glu His Pro 235 240 245			831
ggc tcc agg atg act gct gag aaa ttt ctg aac agg ctc ccc aag ttt Gly Ser Arg Met Thr Ala Glu Lys Phe Leu Asn Arg Leu Pro Lys Phe 250 255 260 265			879
gtg atc cgg caa ggc gag gtg att gac atc cgg ggc ccc atc agg gac Val Ile Arg Gln Gly Glu Val Ile Asp Ile Arg Gly Pro Ile Arg Asp 270 275 280			927
acc ttg cag aac tgc tgc cca ttg cct gcc cgg atc cag gag att gtg Thr Leu Gln Asn Cys Cys Pro Leu Pro Ala Arg Ile Gln Glu Ile Val 285 290 295			975
gtg gag acg ccc acc ttg gcc gct gag cga gag agg agc cag gag tca Val Glu Thr Pro Thr Leu Ala Ala Glu Arg Glu Arg Ser Gln Glu Ser 300 305 310			1023
ccc aac aca ccg gca ccc ccg ctc tcc atg ctg cgc atc aag tct gag Pro Asn Thr Pro Ala Pro Pro Leu Ser Met Leu Arg Ile Lys Ser Glu 315 320 325			1071
aat ggg gaa cag gcc ttc cta ctg atg atg cag cct gac aac acc att Asn Gly Glu Gln Ala Phe Leu Leu Met Met Gln Pro Asp Asn Thr Ile 330 335 340 345			1119
ggg gac gtg cga gct ctg cta gcg cag gcc agg gtc atg gat gcc tct Gly Asp Val Arg Ala Leu Leu Ala Gln Ala Arg Val Met Asp Ala Ser 350 355 360			1167
gcc ttt gag atc ttc agc aca ttc ccg ccc acc ctc tac cag gac gat Ala Phe Glu Ile Phe Ser Thr Phe Pro Pro Thr Leu Tyr Gln Asp Asp 365 370 375			1215
aca ctc acg ctg cag gct gca ggc ctt gtg ccc aaa gca gca ctg ctg Thr Leu Thr Leu Gln Ala Ala Gly Leu Val Pro Lys Ala Ala Leu Leu 380 385 390			1263
ctg cgg gca cgc cga gcc ccg aag tcc agc ctg aaa ttc agt cct ggt Leu Arg Ala Arg Arg Ala Pro Lys Ser Ser Leu Lys Phe Ser Pro Gly			1311

395 400 405
 ccc tgt ccc ggt ccc ggt ccc ggc ccc agt ccc ggt ccc ggt ccc ggc 1359
 Pro Cys Pro Gly Pro Gly Pro Gly Pro Ser Pro Gly Pro Gly Pro Gly
 410 415 420 425

 tcc agt ccc tgt ccc gga ccc agt ccc agc ccc caa taaagcaccc 1405
 Ser Ser Pro Cys Pro Gly Pro Ser Pro Ser Pro Gln
 430 435

 accccctc 1413

 <210> 2
 <211> 437
 <212> PRT
 <213> Homo sapiens

 <400> 2
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 1 5 10 15

 Ala Gln Thr Asp Glu Ile Leu Ser Lys Asp Gln Lys Ile Ala Ala Leu
 20 25 30

 Glu Asp Leu Val Gln Thr Leu Arg Pro His Pro Ala Glu Ala Thr Leu
 35 40 45

 Gln Arg Gln Glu Glu Leu Glu Thr Met Cys Val Gln Leu Gln Arg Gln
 50 55 60

 Val Arg Glu Met Glu Arg Phe Leu Ser Asp Tyr Gly Leu Gln Trp Val
 65 70 75 80

 Gly Glu Pro Met Asp Gln Glu Asp Ser Glu Ser Lys Thr Val Ser Glu
 85 90 95

 His Gly Glu Arg Asp Trp Met Thr Ala Lys Lys Phe Trp Lys Pro Gly
 100 105 110

 Asp Ser Leu Ala Pro Pro Glu Val Asp Phe Asp Arg Leu Leu Ala Ser
 115 120 125

 Leu Gln Asp Leu Ser Glu Leu Val Val Glu Gly Asp Thr Gln Val Thr
 130 135 140

 Pro Val Pro Gly Gly Ala Arg Leu Arg Thr Leu Glu Pro Ile Pro Leu
 145 150 155 160

 Lys Leu Tyr Arg Asn Gly Ile Met Met Phe Asp Gly Pro Phe Gln Pro
 165 170 175

 Phe Tyr Asp Pro Ser Thr Gln Arg Cys Leu Arg Asp Ile Leu Asp Gly
 180 185 190

Phe Phe Pro Ser Glu Leu Gln Arg Leu Tyr Pro Asn Gly Val Pro Phe
 195 200 205
 Lys Val Ser Asp Leu Arg Asn Gln Val Tyr Leu Glu Asp Gly Leu Asp
 210 215 220
 Pro Phe Pro Gly Glu Gly Arg Val Val Gly Arg Gln Arg Met His Lys
 225 230 235 240
 Ala Leu Asp Arg Val Glu Glu His Pro Gly Ser Arg Met Thr Ala Glu
 245 250 255
 Lys Phe Leu Asn Arg Leu Pro Lys Phe Val Ile Arg Gln Gly Glu Val
 260 265 270
 Ile Asp Ile Arg Gly Pro Ile Arg Asp Thr Leu Gln Asn Cys Cys Pro
 275 280 285
 Leu Pro Ala Arg Ile Gln Glu Ile Val Val Glu Thr Pro Thr Leu Ala
 290 295 300
 Ala Glu Arg Glu Arg Ser Gln Glu Ser Pro Asn Thr Pro Ala Pro Pro
 305 310 315 320
 Leu Ser Met Leu Arg Ile Lys Ser Glu Asn Gly Glu Gln Ala Phe Leu
 325 330 335
 Leu Met Met Gln Pro Asp Asn Thr Ile Gly Asp Val Arg Ala Leu Leu
 340 345 350
 Ala Gln Ala Arg Val Met Asp Ala Ser Ala Phe Glu Ile Phe Ser Thr
 355 360 365
 Phe Pro Pro Thr Leu Tyr Gln Asp Asp Thr Leu Thr Leu Gln Ala Ala
 370 375 380
 Gly Leu Val Pro Lys Ala Ala Leu Leu Leu Arg Ala Arg Arg Ala Pro
 385 390 395 400
 Lys Ser Ser Leu Lys Phe Ser Pro Gly Pro Cys Pro Gly Pro Gly Pro
 405 410 415
 Gly Pro Ser Pro Gly Pro Gly Pro Gly Ser Ser Pro Cys Pro Gly Pro
 420 425 430
 Ser Pro Ser Pro Gln
 435
 <210> 3
 <211> 60
 <212> DNA
 <213> Homo sapiens

<400> 3
ttcagcacat tcccgccac cctctaccag gacgatacac tcacgctgca ggctgcaggc 60

<210> 4
<211> 20
<212> PRT
<213> Homo sapiens

<400> 4

Phe Ser Thr Phe Pro Pro Thr Leu Tyr Gln Asp Asp Thr Leu Thr Leu
1 5 10 15

Gln Ala Ala Gly
20

<210> 5
<211> 42
<212> DNA
<213> Homo sapiens

<400> 5
accctctacc aggacgatac actcacgctg caggctgcag gc 42

<210> 6
<211> 14
<212> PRT
<213> Homo sapiens

<400> 6

Thr Leu Tyr Gln Asp Asp Thr Leu Thr Leu Gln Ala Ala Gly
1 5 10

<210> 7
<211> 1028
<212> DNA
<213> Homo sapiens

<400> 7
ctcagtgact atggcctgca gtgggtgggc gagcccatgg accaggagga ctgagagagc 60
aagacagtct cagagcatgg cgagagggac tggatgacag ccaagaagtt ctggaagcca 120
ggggactcat tggcgcccc tgaggtggac tttgacaggc tgctggccag cctgcaggat 180
cttagtgagc tgggtggtaga gggtagacac caagtgacac cagtgcccg cggggcacgg 240
ctgcgtaccc tcgagcccat ccgctgaag ctctaccgga atggcatcat gatgttcgac 300
gggcccttcc agcccttcta cgatccctcc acacagcgct gcctccgaga catattggat 360
ggcttctttc cctcagagct ccagcgactg taccccaatg gggctcccctt taaggtgagt 420
gacttgcgca atcaggtcta cctggaggat ggactggacc ccttcccagg cgagggccgt 480
tggtgggca ggcagcggat gcacaaggcc ttggacaggg tggaggagca cccaggctcc 540
aggatgactg ctgagaaatt tctgaacagg ctccccaagt tttgatccgg caaggcgagg 600
tgattgacat cgggggcccc atcagggaca ccttgagaa ctgctgcca ttgcctgccc 660

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ggatccagga gattgtggtg gagacgcca ccttgccgc tgagcgagag aggagccagg 720
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ccctctacca ggacgataca ctcacgctgc aggctgcagg ccttggtgccc aaagcagcac 960
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ccggtccc 1028

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<210> 8
<211> 343
<212> PRT
<213> Homo sapiens

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<400> 8

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Leu Ser Asp Tyr Gly Leu Gln Trp Val Gly Glu Pro Met Asp Gln Glu
1          5          10          15

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```

Asp Ser Glu Ser Lys Thr Val Ser Glu His Gly Glu Arg Asp Trp Met
          20          25          30

```

```

Thr Ala Lys Lys Phe Trp Lys Pro Gly Asp Ser Leu Ala Pro Pro Glu
          35          40          45

```

```

Val Asp Phe Asp Arg Leu Leu Ala Ser Leu Gln Asp Leu Ser Glu Leu
          50          55          60

```

```

Val Val Glu Gly Asp Thr Gln Val Thr Pro Val Pro Gly Gly Ala Arg
65          70          75          80

```

```

Leu Arg Thr Leu Glu Pro Ile Pro Leu Lys Leu Tyr Arg Asn Gly Ile
          85          90          95

```

```

Met Met Phe Asp Gly Pro Phe Gln Pro Phe Tyr Asp Pro Ser Thr Gln
          100          105          110

```

```

Arg Cys Leu Arg Asp Ile Leu Asp Gly Phe Phe Pro Ser Glu Leu Gln
          115          120          125

```

```

Arg Leu Tyr Pro Asn Gly Val Pro Phe Lys Val Ser Asp Leu Arg Asn
          130          135          140

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```

Gln Val Tyr Leu Glu Asp Gly Leu Asp Pro Phe Pro Gly Glu Gly Arg
145          150          155          160

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Val Val Gly Arg Gln Arg Met His Lys Ala Leu Asp Arg Val Glu Glu
          165          170          175

```

```

His Pro Gly Ser Arg Met Thr Ala Glu Lys Phe Leu Asn Arg Leu Pro
          180          185          190

```

Lys Phe Val Ile Arg Gln Gly Glu Val Ile Asp Ile Arg Gly Pro Ile
 195 200 205

Arg Asp Thr Leu Gln Asn Cys Cys Pro Leu Pro Ala Arg Ile Gln Glu
 210 215 220

Ile Val Val Glu Thr Pro Thr Leu Ala Ala Glu Arg Glu Arg Ser Gln
 225 230 235 240

Glu Ser Pro Asn Thr Pro Ala Pro Pro Leu Ser Met Leu Arg Ile Lys
 245 250 255

Ser Glu Asn Gly Glu Gln Ala Phe Leu Leu Met Met Gln Pro Asp Asn
 260 265 270

Thr Ile Gly Asp Val Arg Ala Leu Leu Ala Gln Ala Arg Val Met Asp
 275 280 285

Ala Ser Ala Phe Glu Ile Phe Ser Thr Phe Pro Pro Thr Leu Tyr Gln
 290 295 300

Asp Asp Thr Leu Thr Leu Gln Ala Ala Gly Leu Val Pro Lys Ala Ala
 305 310 315 320

Leu Leu Leu Arg Ala Arg Arg Ala Pro Lys Ser Ser Leu Lys Phe Ser
 325 330 335

Pro Gly Pro Cys Pro Gly Pro
 340

<210> 9
 <211> 6
 <212> PRT
 <213> Homo sapiens

<400> 9

Phe Ser Thr Phe Pro Pro
 1 5

<210> 10
 <211> 6
 <212> PRT
 <213> Homo sapiens

<400> 10

Leu Val Pro Lys Ala Ala
 1 5

<210> 11
 <211> 294
 <212> DNA
 <213> Homo sapiens

<400> 11
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 ttcagcacat tccgcccac cctctaccag gacgatacac tcacgtgca ggctgcaggc 120
 cttgtgcccc aagcagcact gctgctgcgg gcacgccgag ccccgaagtc cagcctgaaa 180
 ttcagtcctg gtccctgtcc cggccccggc cccggcccca gtcccgggtcc cggccccggc 240
 tccagtcctt gtcccggacc cagtcaccag cccaataaa gcacccacc cctc 294

<210> 12
 <211> 92
 <212> PRT
 <213> Homo sapiens

<400> 12

Gly Asp Val Arg Ala Leu Leu Ala Gln Ala Arg Val Met Asp Ala Ser
 1 5 10 15

Ala Phe Glu Ile Phe Ser Thr Phe Pro Pro Thr Leu Tyr Gln Asp Asp
 20 25 30

Thr Leu Thr Leu Gln Ala Ala Gly Leu Val Pro Lys Ala Ala Leu Leu
 35 40 45

Leu Arg Ala Arg Arg Ala Pro Lys Ser Ser Leu Lys Phe Ser Pro Gly
 50 55 60

Pro Cys Pro Gly Pro Gly Pro Gly Pro Ser Pro Gly Pro Gly Pro Gly
 65 70 75 80

Ser Ser Pro Cys Pro Gly Pro Ser Pro Ser Pro Gln
 85 90

<210> 13
 <211> 19
 <212> DNA
 <213> ARTIFICIAL

<220>
 <223> PCR primer sequence

<400> 13
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<210> 14
 <211> 18
 <212> DNA
 <213> artificial

<220>
 <223> PCR primer sequence

<400> 14
 ccttgaatgt ggtcatct 18

<210> 15
 <211> 23
 <212> DNA
 <213> artificial

<220>
 <223> PCR primer sequence

<400> 15
 cgtttcttgg agtactctac gtc 23

<210> 16
 <211> 20
 <212> DNA
 <213> artificial

<220>
 <223> PCR primer sequence

<400> 16
 ccaccgcgcc ccgctcgtct 20

<210> 17
 <211> 20
 <212> PRT
 <213> Homo sapiens

<400> 17

Phe Ser Thr Phe Pro Pro Thr Leu Tyr Gln Asp Asp Thr Leu Thr Leu
 1 5 10 15

Gln Ala Ala Gly
 20

<210> 18
 <211> 20
 <212> PRT
 <213> Homo sapiens

<400> 18

Thr Leu Tyr Gln Asp Asp Thr Leu Thr Leu Gln Ala Ala Gly Leu Val
 1 5 10 15

Pro Lys Ala Ala
 20

<210> 19
 <211> 1771
 <212> DNA
 <213> Homo sapiens

<400> 19
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 aggagcaggc agataacaga aacttcaga aacctctgtg gagacagtgg aagaggcaaa 180
 agggagttcc tgacagctgg attctagaag tagaactatg agctcacctt tggcctccct 240

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tagcaagacc cgaaaagtgc ccctgccctc ggagcctatg aatcctggga ggcgaggaat   300
ccgcatctat ggagatgaag atgaggtgga catgttgagt gatgggtgtg gctcggaaga   360
aaagatctca gtcccttcct gctatggcgg cataggtgcc cctgtgagtc ggcaagtccc   420
tgcaccccat gactcggagc tgatggcctt catgacgagg aagttgtggg acctggagca   480
gcaggtgaag gccagactg atgagatact gtccaaggat cagaagatag cggccctaga   540
ggacctggtg cagaccctcc ggccacaccc agccgaggca accctgcagc ggcaggagga   600
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tgactatggc ctgcagtggg tgggcgagcc catggaccag gaggactcag agagcaagac   720
agtctcagag catggcgaga gggactggat gacagccaag aagttctgga agccagggga   780
ctcattggcg ccccttgagg tggactttga caggctgctg gccagcctgc aggatcttag   840
tgagctggtg gtagaggggtg acaccaagt gacaccagt cccggcgggg cacggctgcg   900
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ctttccctca gagctccagc gactgtaccc caatggggtc ccctttaagg tgagtgactt  1080
gcgcaatcag gtctacctgg aggatggact ggacccttc ccaggcgagg gccgtgtggt  1140
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gactgctgag aaatttctga acaggctccc caagtttgtg atccggcaag gcgaggtgat  1260
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ccaggagatt gtggtggaga cgccacctt gccgctgag cgagagagga gccaggagtc  1380
acccaacaca ccggcacccc cgctctccat gctgcgcac aagtctgaga atggggaaca  1440
ggccttccta ctgatgatgc agcctgacaa caccattggg gacgtgcgag ctctgctagc  1500
gcaggccagg gtcatggatg cctctgcctt tgagatcttc agcacattcc cgccaccct  1560
ctaccaggac gatacactca cgctgcaggc tgcaggcctt gtgcccagg cagcactgct  1620
gctgcgggca cgccgagccc cgaagtccag cctgaaattc agtctggtc cctgtcccgg  1680
tcccggctcc ggcccagtc ccggtcccgg tcccggctcc agtcctgtc ccggaccag  1740
tcccagcccc caataaagca cccgccccct c                                     1771

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<210> 20
 <211> 512
 <212> PRT
 <213> Homo sapiens

<400> 20

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Met Ser Ser Pro Leu Ala Ser Leu Ser Lys Thr Arg Lys Val Pro Leu
1           5           10           15

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Pro Ser Glu Pro Met Asn Pro Gly Arg Arg Gly Ile Arg Ile Tyr Gly
20           25           30

```

Asp Glu Asp Glu Val Asp Met Leu Ser Asp Gly Cys Gly Ser Glu Glu
 35 40 45
 Lys Ile Ser Val Pro Ser Cys Tyr Gly Gly Ile Gly Ala Pro Val Ser
 50 55 60
 Arg Gln Val Pro Ala Ser His Asp Ser Glu Leu Met Ala Phe Met Thr
 65 70 75 80
 Arg Lys Leu Trp Asp Leu Glu Gln Gln Val Lys Ala Gln Thr Asp Glu
 85 90 95
 Ile Leu Ser Lys Asp Gln Lys Ile Ala Ala Leu Glu Asp Leu Val Gln
 100 105 110
 Thr Leu Arg Pro His Pro Ala Glu Ala Thr Leu Gln Arg Gln Glu Glu
 115 120 125
 Leu Glu Thr Met Cys Val Gln Leu Gln Arg Gln Val Arg Glu Met Glu
 130 135 140
 Arg Phe Leu Ser Asp Tyr Gly Leu Gln Trp Val Gly Glu Pro Met Asp
 145 150 155 160
 Gln Glu Asp Ser Glu Ser Lys Thr Val Ser Glu His Gly Glu Arg Asp
 165 170 175
 Trp Met Thr Ala Lys Lys Phe Trp Lys Pro Gly Asp Ser Leu Ala Pro
 180 185 190
 Pro Glu Val Asp Phe Asp Arg Leu Leu Ala Ser Leu Gln Asp Leu Ser
 195 200 205
 Glu Leu Val Val Glu Gly Asp Thr Gln Val Thr Pro Val Pro Gly Gly
 210 215 220
 Ala Arg Leu Arg Thr Leu Glu Pro Ile Pro Leu Lys Leu Tyr Arg Asn
 225 230 235 240
 Gly Ile Met Met Phe Asp Gly Pro Phe Gln Pro Phe Tyr Asp Pro Ser
 245 250 255
 Thr Gln Arg Cys Leu Arg Asp Ile Leu Asp Gly Phe Phe Pro Ser Glu
 260 265 270
 Leu Gln Arg Leu Tyr Pro Asn Gly Val Pro Phe Lys Val Ser Asp Leu
 275 280 285
 Arg Asn Gln Val Tyr Leu Glu Asp Gly Leu Asp Pro Phe Pro Gly Glu
 290 295 300

Gly Arg Val Val Gly Arg Gln Arg Met His Lys Ala Leu Asp Arg Val
 305 310 315 320

Glu Glu His Pro Gly Ser Arg Met Thr Ala Glu Lys Phe Leu Asn Arg
 325 330 335

Leu Pro Lys Phe Val Ile Arg Gln Gly Glu Val Ile Asp Ile Arg Gly
 340 345 350

Pro Ile Arg Asp Thr Leu Gln Asn Cys Cys Pro Leu Pro Ala Arg Ile
 355 360 365

Gln Glu Ile Val Val Glu Thr Pro Thr Leu Ala Ala Glu Arg Glu Arg
 370 375 380

Ser Gln Glu Ser Pro Asn Thr Pro Ala Pro Pro Leu Ser Met Leu Arg
 385 390 395 400

Ile Lys Ser Glu Asn Gly Glu Gln Ala Phe Leu Leu Met Met Gln Pro
 405 410 415

Asp Asn Thr Ile Gly Asp Val Arg Ala Leu Leu Ala Gln Ala Arg Val
 420 425 430

Met Asp Ala Ser Ala Phe Glu Ile Phe Ser Thr Phe Pro Pro Thr Leu
 435 440 445

Tyr Gln Asp Asp Thr Leu Thr Leu Gln Ala Ala Gly Leu Val Pro Lys
 450 455 460

Ala Ala Leu Leu Leu Arg Ala Arg Arg Ala Pro Lys Ser Ser Leu Lys
 465 470 475 480

Phe Ser Pro Gly Pro Cys Pro Gly Pro Gly Pro Gly Pro Ser Pro Gly
 485 490 495

Pro Gly Pro Gly Ser Ser Pro Cys Pro Gly Pro Ser Pro Ser Pro Gln
 500 505 510